

WHAT IS CLAIMED IS:

1. A process for the preparation of isoolefin copolymers in the presence of zirconium halides and/or hafnium halides, comprising the step
5 of polymerizing monomers in the presence of organic acid halides.

2. A process according to Claim 1, wherein said organic acid halide corresponds to the general formula (I)

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$$\text{R-COX} \quad (\text{I}),$$

wherein R is selected from the group consisting of C₁-C₁₈-alkyl, C₃-C₁₈-cycloalkyl and C₆-C₂₄-cycloaryl, and X may be fluorine, chlorine, bromine or iodine.

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3. A process according to Claim 1 wherein the concentration of the organic acid halide in the reaction medium is within the range of 1 to 500 ppm.

20 4. A process according to Claim 1, wherein said zirconium halide is ZrCl₄ and said hafnium halide is HfCl₄.

5. A process according to Claim 1, wherein isobutene is copolymerized with isoprene and optionally further monomers.

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6. A process according to Claim 1, wherein AlCl₃ or a catalyst system which is preparable from AlCl₃ is additionally utilized.

7. A mixture of zirconium halide and/or hafnium halide and
30 organic acid halide corresponding to the general formula (I)

R-COX (I),

wherein R is selected from the group consisting of C₁-C₁₈-alkyl, C₃-C₁₈-cycloalkyl and C₆-C₂₄-cycloaryl, and X may be fluorine, chlorine, bromine or iodine.

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8. A catalyst comprising a mixture of zirconium halide and/or hafnium halide and organic acid halide corresponding to the general formula (I)

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R-COX (I),

wherein R is selected from the group consisting of C₁-C₁₈-alkyl, C₃-C₁₈-cycloalkyl and C₆-C₂₄-cycloaryl, and X may be fluorine, chlorine, bromine or iodine.

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9. A polymer which is prepared by the polymerization of monomers in the presence of i) zirconium halides and/or hafnium halides, and also ii) organic acid halides.

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10. A polymer according to Claim 9, wherein said organic acid halide corresponds to the general formula (I)

R-COX (I),

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wherein R is selected from the group consisting of C₁-C₁₈-alkyl, C₃-C₁₈-cycloalkyl and C₆-C₂₄-cycloaryl, and X may be fluorine, chlorine, bromine or iodine.

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11. A polymer according to Claim 9, wherein the concentration of the organic acid halide in the reaction medium is within the range of 1 to 500 ppm.

12. A polymer according to Claim 9, wherein said zirconium halide is ZrCl_4 and said hafnium halide is HfCl_4 .

5 13. A polymer according to Claim 9, wherein isobutene is copolymerized with isoprene and optionally further monomers.

14. A polymer according to Claim 9, wherein AlCl_3 or a catalyst system which is preparable from AlCl_3 is additionally utilized.

10 15. A polymer according to Claim 9, comprising up to 30 mol% isoprene.

16. A molded body comprising a polymer which is prepared by the polymerization of monomers in the presence of
15 i) zirconium halides and/or hafnium halides, and also
ii) organic acid halide.